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Ronald Barten

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EXAMINER

MUMMERT, STEPHANIE KANE

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**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/534,711	<b>Applicant(s)</b> BARTEN ET AL.	
	<b>Examiner</b> STEPHANIE K. MUMMERT	<b>Art Unit</b> 1637	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 17 February 2009.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-37 is/are pending in the application.
- 4a) Of the above claim(s) 31-37 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-30 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)          | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____                                      |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)          | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____  | 6) <input type="checkbox"/> Other: _____                          |

## **DETAILED ACTION**

### ***Withdrawal of Finality***

Applicant's request for reconsideration of the finality of the rejection of the last Office action is persuasive and, therefore, the finality of that action is withdrawn.

Applicant's amendment filed on February 17, 2009 is acknowledged and has been entered. Claims 1-30 are pending. Claims 31-37 are withdrawn from consideration as being drawn to a non-elected invention.

Claims 1-30 are discussed in this Office action.

### ***Response to Arguments***

Applicant's arguments, see p. 18-19, filed February 17, 2009, with respect to the rejection(s) of claim(s) 1-2, 4-9, 12-19 and 21 under 35 U.S.C. 103 have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of Heath and Wong, using a different application of the art over step d) of claim 1.

All of the remaining amendments and arguments have been thoroughly reviewed and considered but are not found persuasive for the reasons discussed below. Any rejection not reiterated in this action has been withdrawn as being obviated by the amendment of the claims.

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The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

**This action is made NON-FINAL.**

### **New Grounds of Rejection**

The rejection of claim 1 has been amended so that step d) is taught by Heath. The motivation statement has also been updated.

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

8. Claims 1-2, 4-9, 12-19 and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wong et al. (US Patent 5,935,793; August 1999) in view of Heath et al. (Journal of Medical Genetics, 2000, 37: 272-280). Wong teaches a method that comprises amplification using tagged primers and hybridization of the amplification products to an identifying tag specific array (Abstract).

With regard to claim 1, Wong teaches a method for detecting different nucleic acids A in parallel, comprising the following steps:

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a) providing in each case one first primer which is suitable for carrying out a primer extension together with one of the nucleic acids A and which contains a first primer (P1) and a second primer (P2) (Figure 1, where the format of the primers are disclosed, wherein the primer(s) include a 3' flanking target specific sequence (44), an identifier specific sequence in the middle (42), and a 5' flanking tag sequence (46); see also col. 21, lines 8-28),

with the first primer (P1) exhibiting a 5' terminal first constituent segment (c1) and a 3' terminal second constituent segment (c2) and the second primer (P2) exhibiting a 5' terminal third constituent segment (c3) and a 3' terminal fourth constituent segment (c4), with the sequences of the second constituent segment (c2) and the fourth constituent segment (c4) being selected such that the second constituent segment (c2) can hybridize specifically, under defined first conditions, with a predetermined first segment of the one of the nucleic acids A, and be enzymatically extended, and the fourth constituent segment (c4) can hybridize specifically, under defined second conditions, with a predetermined second segment of a nucleic acid A' which is complementary to the one of the nucleic acids A, and be enzymatically extended (Figure 1, where the format of the primers are disclosed, wherein the primer(s) include a 3' flanking target specific sequence (44), an identifier specific sequence in the middle (42), and a 5' flanking tag sequence (46); see also col. 21, lines 8-28), and

with in each case an intermediate segment i, which connects the first constituent segment (c1) to the second constituent segment (c2) and is specific for the second constituent segment (c2), or an intermediate segment i, which connects the third constituent segment (c3) to the fourth constituent segment (c4) and is specific for the fourth constituent segment (c4), being provided (col. 4, lines 23-44, where the primers include an identifier tag sequence that is

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intermediate between the flanking target specific sequence and the 5' flanking tag sequence; col. 7, line 45 to col. 8, line 23),

with the first (P1) or second primers (P2) of the first primer pairs in each case differing in the intermediate segment i and in the second constituent segment (c2) or fourth constituent segment (c4) which is arranged in connection thereto, with each of the second (c2) or fourth constituent segments (c4) being specific for precisely one of the nucleic acids A (col. 4, lines 23-44, where the primers include an identifier tag sequence that is intermediate between the flanking target specific sequence and the 5' flanking tag sequence; col. 7, line 45 to col. 8, line 23, wherein the intermediate identifier sequence is specific for a target and are unique for each target and are incorporated into the primer sequence);

b) bringing the different nucleic acids A, or the nucleic acids A' which are complementary thereto, into contact with the first primer pairs in a solution and carrying out a first primer extension reaction in which the first primers (P1) are extended, under the first conditions, or the second primers (P2) are extended, under the second conditions, at least once and at least so far that the respective other primers (P2, P1) of the first primer pairs are able to bind specifically, under the first or second conditions which are required for their specific hybridization, to in each case one first primer extension product which is formed in this connection (col. 4, lines 6-44, where the first and second primers are used in a primer extension reaction, producing fragment with set sequences at the respective ends),

e) bringing the second primer extension products into contact with the respective second primer pairs and carrying out a PCR, with in each case the intermediate segment i, or an intermediate segment i' which is complementary thereto, being amplified with the formation of third primer

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extension products (col. 18, line 60 to col. 19, line 12, where third and fourth primers specific for the tag sequence are used in PCR to amplify the intermediate identifying tag sequence),

f) providing in each case one immobilized probe (Pr) for each nucleic acid A to be detected, with the probe (Pr) being in each case able to hybridize specifically, under defined fourth conditions, with one of the intermediate segments i or one of the intermediate segments i' which are complementary thereto (col. 19, line 32 to col. 20, line 43, where the fragments are hybridized to an array of probes specific for the identifier sequence or 'intermediate' sequence, see especially col. 19, lines 33-41),

g) bringing the probes (Pr) into contact with the third primer extension products under the fourth conditions (col. 19, line 32 to col. 20, line 43, where the fragments are hybridized to an array of probes specific for the identifier sequence or 'intermediate' sequence, see especially col. 19, lines 33-41), and

h) detecting the third primer extension products which bind, or are bound, to the probes (Pr) (col. 19, line 32 to col. 20, line 43, where the fragments are hybridized to an array of probes specific for the identifier sequence or 'intermediate' sequence, see especially col. 19, lines 33-41).

With regard to claim 5, Wong teaches an embodiment of claim 1, wherein the sequences of the first constituent segment (c1) and third constituent segment (c3) are selected such that the third conditions can be so stringent that the second constituent segment (c2) does not significantly hybridize, under the third conditions, with the first segment of the one of the nucleic acids A and the fourth constituent segment (c4) does not significantly hybridize, under the third conditions, with the second segment of the nucleic acid A' which is complementary to the one of the nucleic acids A (col. 4, lines 45-60, where when the primer-tag-primer of Figure 1B is used

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in the method, primers complementary to the flanking sequences in the primer amplifies the identifier tag sequence incorporated into the amplified and extended fragments).

With regard to claim 6, Wong teaches an embodiment of claim 1, wherein the sequences and concentrations of the first (P1), second (P2), third (P3) and fourth primers (P4) are selected such that the specific annealing temperatures of the third primer (P3), which hybridizes with the sequence which is complementary to the first constituent segment (c1), and of the fourth primer (P4), which hybridizes with the sequence which is complementary to the third constituent segment (c3), are in each case at least 5°C higher than the in each case higher annealing temperatures of the second constituent segment (c2), which hybridizes with the first segment of one of the nucleic acids A, and of the fourth constituent segment (c4), which hybridizes with the second segment of the complementary nucleic acid A' (col. 4, lines 45-60, where when the primer-tag-primer of Figure 1B is used in the method, primers complementary to the flanking sequences in the primer amplifies the identifier tag sequence incorporated into the amplified and extended fragments).

With regard to claim 7, Wong teaches an embodiment of claim 1, wherein step e is carried out in the solution (col. 18, line 60 to col. 19, line 12, where third and fourth primers specific for the tag sequence are used in PCR to amplify the intermediate identifying tag sequence).

With regard to claim 8, Wong teaches an embodiment of claim 1, wherein at least steps a to e, in particular steps a to h, are carried out in a closed vessel which is not opened between the steps (col. 18, line 60 to col. 19, line 12, where third and fourth primers specific for the tag sequence are used in PCR to amplify the intermediate identifying tag sequence).



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With regard to claim 15, Wong teaches an embodiment of claim 1, wherein a multiplicity of first primer pairs whose first primers (P1) exhibit an in each case identical or almost identical first constituent segment (c1) and/or whose second primers (P2) exhibit an in each case identical or almost identical third constituent segment (c3), and whose second constituent segment (c2) or fourth constituent segment (c4) is in each case specific for precisely one of the nucleic acids A, is added to the solution (col. 4, lines 45-60, where when the primer-tag-primer of Figure 1B is used in the method, primers complementary to the flanking sequences in the primer amplifies the identifier tag sequence incorporated into the amplified and extended fragments).

With regard to claim 17, Wong teaches an embodiment of claim 1, wherein the sequences of the intermediate segments i are selected such that neither they themselves, nor the intermediate segments i' which are complementary thereto, hybridize, in the method, with themselves or with the first (c1), second (c2), third (c3) or fourth constituent segments (c4) or their complementary sequences (col. 7, lines 45 to col. 8, line 4, where the identifier tag is selected so that it is unique and does not comprise cross-hybridization with each other or with other components under stringent hybridization conditions).

With regard to claim 18, Wong teaches an embodiment of claim 1, wherein the sequences of the intermediate segments i are selected such that hybrids of the intermediate segments i with nucleic acids which were in each case completely complementary thereto would have melting temperatures which are essentially identical, lying, in particular, in a temperature range of 5°C (col. 7, lines 45 to col. 8, line 4, where the identifier tag or intermediate segments are selected so that hybrids have a melting temperature within a specific temperature range).

With regard to claim 19, Wong teaches an embodiment of claim 1, wherein, for specifically detecting one of the nucleic acids A in the presence of another nucleic acid which only differs from the one of the nucleic acids A in one first base which is contained in the one of the nucleic acids A, the sequences of the first (P1) or second primers (P2) are selected such that the respective base of the second (c2) or fourth constituent segment (c4), which base is complementary to the first base or to a second base, which is complementary thereto, of a complementary nucleic acid A', is located at the 3' end, or in the vicinity of the 3' end, of the in each case first (P1) or second primer (P2) (col. 11, lines 44-60).

With regard to claim 21, Wong teaches an embodiment of claim 1, wherein the respective sequences of the first (P1), second (P2), third (P3) and fourth primers (P4), and of the probe (Pr), are selected such that in each case the first, in each case the second, in each case the third and/or in each case the fourth conditions for detecting the different nucleic acids A are identical (col. 7, lines 45 to col. 8, line 4, where the identifier tag or intermediate segments are selected so that hybrids have a melting temperature within a specific temperature range).

Regarding claim 1, Wong does not explicitly teach the use of a pair of PCR primers for step a) and instead refers to the first step of the method as requiring at least one primer for the extension of the original sample sequences and while this teaching could encompass PCR amplification, this teaching is not explicit therefore also does not explicitly teach the components of step c) where the carrying out a second primer extension reaction in which the first primer extension products in each case serve as a template and the respective second (P2) or first primers (P1) are extended, under the first or second conditions which are required for their specific hybridization with the respective first primer extension products, with the formation of

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in each case one second primer extension product. Furthermore, regarding step d) of claim 1, while Wong teaches flanking sequences, the sequences are not explicitly taught as at either end of an amplification product.

With regard to claim 1, Heath teaches amplification of sample using tagged primers in a PCR reaction (Figure 1, where the primers are used in a first PCR using the first pair of primers and again in the second round of amplification using the universal flanking primers; p. 273-274, 'universal primer quantitative fluorescent multiplex PCR' heading) and thereby teaches c) carrying out a second primer extension reaction in which the first primer extension products in each case serve as a template and the respective second (P2) or first primers (P1) are extended, under the first or second conditions which are required for their specific hybridization with the respective first primer extension products, with the formation of in each case one second primer extension product (Figure 1, where the primers are used in a first PCR using the first pair of primers and again in the second round of amplification using the universal flanking primers; p. 273-274, 'universal primer quantitative fluorescent multiplex PCR' heading); and d) providing in each case one second primer pair which in each case contains a third primer (P3) and a fourth primer (P4) and which is suitable for carrying out a PCR together with the respective second primer extension products, with the sequences of the third primer (P3) and fourth primer (P4) being in each case selected such that the third primer (P3) can in each case hybridize specifically, under defined third conditions, with a sequence which is complementary to the first constituent segment (c1), and be enzymatically extended, and the fourth primer (P4) can in each case hybridize specifically, under defined third conditions, with a sequence which is complementary to the third constituent segment (c3) and be enzymatically extended (Figure 1,

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where the primers used in a first PCR using the first pair of primers with a universal tag (black) and in the second round of amplification the universal flanking primers are extended (unfilled rectangles) which correspond to the third and fourth primer, P3 and P4, which are complementary to the first and third constituent segments, which correspond to the universal tag (black) in the first set of primers in Figure 1; p. 273-274, 'universal primer quantitative fluorescent multiplex PCR' heading).

With regard to claim 2, Heath teaches an embodiment of claim 1, wherein the first primer extension reaction and the second primer extension reaction are carried out as PCRs (Figure 1, where the primers are used in a first PCR using the first pair of primers and again in the second round of amplification using the universal flanking primers).

With regard to claim 4, Heath teaches an embodiment of claim 1, wherein the first primer extension reaction is carried out, under the first conditions, and/or the second primer extension reaction is carried out, under the second conditions, at most 10 times, preferably at most 5 times, in particular at most 2 times (p. 274, where the first primer extension reaction is carried out for at most 10 times).

With regard to claim 9, Heath teaches an embodiment of claim 1, wherein the concentration, in the solution, of the first or second primer (P1, P2) containing the intermediate segment *i* is selected to be so low that this primer (P1, P2) does not significantly inhibit a hybridization of the probe (Pr) with the respective intermediate segment *i*, or the intermediate segment *i'* which is complementary thereto, of the third primer extension products in step g (p. 273-274, where the primers are added in differing concentrations, including from 3 pmol to 8 pmol.).

With regard to claim 12, Heath teaches an embodiment of claim 1, wherein the second primer pairs are added to the solution prior to the first primer extension reaction (Figure 1, where the primers are used in a first PCR using the first pair of primers and again in the second round of amplification using the universal flanking primers; p. 273-274, 'universal primer quantitative fluorescent multiplex PCR' heading).

With regard to claim 13, Heath teaches an embodiment of claim 1, wherein, in step e, in each case the third primer (P3) or the fourth primer (P4) is extended more frequently than is the respective other primer (P4, P3) of the respective second primer pairs (Figure 1, where the primers are used in a first PCR using the first pair of primers and again in the second round of amplification using the universal flanking primers).

With regard to claim 14, Heath teaches an embodiment of claim 1, wherein, in the second primer pair which is provided in step d, the third primer (P3) or the fourth primer (P4) is present in excess as compared with the respective other primer (P4, P3) which is present therein (p. 273-274, where the primers are added in differing concentrations, including from 3 pmol to 8 pmol.).

With regard to claim 16, Heath teaches an embodiment of claim 1, wherein the sequences of the first (P1), second (P2), third (P3) and fourth primers (P4) are selected such that they do not form any primer dimers and/or do not hybridize with themselves or with each other in the method (p. 273-274, where the primers were designed as efficient for producing sequencing products).

It would have been *prima facie* obvious to one of ordinary skill in the art at the time the invention was made to have applied the primer format of Wong, into the method of amplification taught by Heath to arrive at the claimed invention with a reasonable expectation for success. As

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taught by Heath, "the UPQFM-PCR is a rapid way of detecting major and minor rearrangements in any gene of interest. The method only requires small amounts of starting material which is then amplified, resolved by electrophoresis and quantified using fluorescence" (p. 277, col. 2).

The two techniques share a 'universal' primer site and an intermediate region. The major differences lie in the means for detecting sequencing products. Heath detects the products using fluorescence detection in a thermal cycler, while Wong teaches detection through hybridization to a microarray. However, the methods are similar enough, regarding the inclusion of tagged primers and second round amplification using a tag specific primer, that it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the universal tagged primer format taught by Wong in a PCR amplification technique, as taught by Heath with a reasonable expectation for success.

9. Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Wong et al. (US Patent 5,935,793; August 1999) in view of Heath et al. (Journal of Medical Genetics, 2000, 37: 272-280) as applied to claims 1-2, 4-9, 12-19 and 21 above, and further in view of Moretti et al. (Biotechniques, 1998, vol. 25, no. 4, p. 716-722). Wong teaches a method that comprises amplification using tagged primers and hybridization of the amplification products to an identifying tag specific array (Abstract).

Wong in view of Heath teach the limitations of claims 1-2, 4-9, 12-19 and 21. However, neither teach amplification under hot start conditions. Moretti teaches amplification using a hot start polymerase (Abstract).

With regard to claim 3, Moretti teaches an embodiment of claim 1, wherein the first primer extension reaction and/or the second primer extension reaction and/or the PCR(s) is/are carried out under hot start conditions (materials and methods, p. 717-718).

It would have been *prima facie* obvious to one of ordinary skill in the art at the time the invention was made to have adjusted the teachings of Heath and Wong to incorporate the hot start amplification of Moretti to arrive at the claimed invention with a reasonable expectation for success. As taught by Moretti, “AmpliTaq Gold™ DNA polymerase is a thermostable enzyme that differs from AmpliTaq™ DNA polymerase by remaining inactive until exposed to a high temperature. It effectively simulates ‘hot start’ PCR in a fast, simple and practical fashion. The use of AmpliTaq Gold DNA polymerase can reduce or eliminate the generation of nonspecific PCR products that can result from mispriming’and primer oligomerization” (p. 716, col. 2 to p. 717, col. 1). Therefore, one of ordinary skill in the art at the time the invention was made would have been motivated to have adjusted the teachings of Heath and Wong to incorporate the hot start amplification of Moretti to arrive at the claimed invention with a reasonable expectation for success.

10. Claim 10-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wong et al. (US Patent 5,935,793; August 1999) in view of Heath et al. (Journal of Medical Genetics, 2000, 37: 272-280) as applied to claims 1-2, 4-9, 12-19 and 21 above. Wong teaches a method that comprises amplification using tagged primers and hybridization of the amplification products to an identifying tag specific array (Abstract).

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With regard to claim 10, Heath teaches an embodiment of claim 1, wherein the concentration, in the solution, of the in each case first primer pair is set to be from 0.001 to 0.1 gmol/l (p. 273-274, where the primers are added in differing concentrations, including from 3 pmol to 8 pmol.).

With regard to claim 11, Heath teaches an embodiment of claim 1, wherein the ratio of the concentrations of the in each case first primer pair to the in each case second primer pair is less than 1:10, preferably less than 1:100, particularly preferably less than 1:1000 (p. 273-274, where the primers are added in differing concentrations, including from 3 pmol to 8 pmol.).

While neither Heath nor Wong teach the specific concentration, an ordinary practitioner would have recognized that the results optimizable variables of time, product amount and concentration of primers could be adjusted to maximize the desired results. As noted in *In re Aller*, 105 USPQ 233 at 235,

More particularly, where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation.

Routine optimization is not considered inventive and no evidence has been presented that the concentration chosen was other than routine, that the products resulting from the optimization have any unexpected properties, or that the results should be considered unexpected in any way as compared to the closest prior art.

11. Claim 20 is rejected under 35 U.S.C. 103(a) as being unpatentable over Wong et al. (US Patent 5,935,793; August 1999) in view of Heath et al. (Journal of Medical Genetics, 2000, 37: 272-280) as applied to claims 1-2, 4-9, 12-19 and 21 above, and further in view of Okimoto et al.



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(Biotechniques, 1996, vol. 21, no. 1, p. 20, 22, 24, 26). Wong teaches a method that comprises amplification using tagged primers and hybridization of the amplification products to an identifying tag specific array (Abstract).

Wong in view of Heath teach the limitations of claims 1-2, 4-9, 12-19 and 21. However, neither teach amplification using a primer comprising a mismatch sequence. Okimoto teaches a method for improved amplification of SNP alleles using internally mismatched primers (Abstract).

With regard to claim 20, Okimoto teaches an embodiment of claim 1, wherein the second (c2) or fourth constituent segments (c4) contain a base which is not complementary to a third base, which corresponds to it in its position, in the first segment of the one of the nucleic acids A or in the second segment of the nucleic acid A' (Table 1, where primers comprise mismatches to the wild-type sequence, see also Figure 1).

It would have been *prima facie* obvious to one of ordinary skill in the art at the time the invention was made to have applied the method of mismatched amplification to the teachings of Heath and Wong to arrive at the claimed invention with a reasonable expectation for success. The methods taught by both Heath and Wong are directed to detection and sequencing of nucleic acids. As taught by Okimoto, "modification of PASA involves the use of internal primer mismatches to confer improved allele specificity. An additional mismatch (to all alleles) internal to the allele specific primer can improve specificity and also allow for the amplification of shorter PCR products" (p. 22, col. 1). Therefore, one of ordinary skill in the art at the time the invention was made would have been motivated to have applied the method of mismatched

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amplification to the teachings of Heath and Wong to arrive at the claimed invention with a reasonable expectation for success.

12. Claims 22-26, 28 and 29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wong et al. (US Patent 5,935,793; August 1999) in view of Heath et al. (Journal of Medical Genetics, 2000, 37: 272-280) as applied to claims 1-2, 4-9, 12-19 and 21 above, and further in view of Thorp et al. (WO 00/55366; September 2000). Wong teaches a method that comprises amplification using tagged primers and hybridization of the amplification products to an identifying tag specific array (Abstract).

With regard to claim 22, Wong teaches an embodiment of claim 1, wherein the probe (Pr) is in each case immobilized on an array or in its immediate vicinity (col. 19, line 32 to col. 20, line 43, where the fragments are hybridized to an array of probes specific for the identifier sequence or 'intermediate' sequence, see especially col. 19, lines 33-41).

With regard to claim 28, Wong teaches an embodiment of claim 1, wherein use is made of a multiplicity of different probes (Pr) which are complementary to the intermediate segments i or to the intermediate segments i' which are complementary thereto, each of which probes is bound to, or in the immediate vicinity of, a separate array (col. 19, line 32 to col. 20, line 43, where the fragments are hybridized to an array of probes specific for the identifier sequence or 'intermediate' sequence, see especially col. 19, lines 33-41; , where a plurality of arrays are arranged on the surface).

With regard to claim 29, Wong teaches an embodiment of claim 1, wherein use is made of a multiplicity of arrays which are arranged on a surface, in particular an electrode chip, so as

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to be individually bonded or bondable (col. 19, line 32 to col. 20, line 43, where the fragments are hybridized to an array of probes specific for the identifier sequence or 'intermediate' sequence, see especially col. 19, lines 33-41; Figure 5, where a plurality of arrays are arranged on the surface).

Regarding claim 22, Wong does not teach the detection of a probe sequence immobilized on an electrode. Thorp teaches the detection of nucleic acid sequences using an electrode comprising a thin film on the conductive working surface, wherein a DNA probe is attached to a carboxylate group and in the presence of guanine containing moieties, an enhancement in oxidative current is observed (Abstract).

With regard to claim 22, 27, 28 and 29, Thorp teaches an embodiment of claim 1, wherein the probe (Pr) is in each case immobilized on an electrode (E) or in its immediate vicinity (Examples 3 and 4, where single stranded DNA is immobilized to an electrode and detected; see also Example 6, where guanine sequences were detected on the electrode and Examples 7 and 8 where immobilized probes are detected).

With regard to claim 23, Thorp teaches an embodiment of claim 1, wherein the detection in step h is effected by detecting a change in a fluorescence-optical property or a change, which is determined by the hybridization, in an electrical property at the electrode (E) (Example 6 and 8, where guanine sequences were detected on the electrode and in the presence of guanine a change in conductivity is observed, see Abstract and p. 22-23, where the catalytic enhancement of oxidation current in the presence of a 20-mer G probe indicate that approximate 10 uC more charge or  $10^{-10}$  more moles of electrons are transferred when compared to oxidation of polymer alone).

With regard to claim 24, Thorp teaches an embodiment of claim 23, wherein a change in a redox property, in particular in association with the oxidation of guanine or adenine residues of the third primer extension products, in an impedance or in a conductivity is measured, as the change in the electrical property, using the electrode (E) (Example 6 and 8, where guanine sequences were detected on the electrode and in the presence of guanine a change in conductivity is observed, see Abstract and p. 22-23, where the catalytic enhancement of oxidation current in the presence of a 20-mer G probe indicate that approximate 10 uC more charge or  $10^{-10}$  more moles of electrons are transferred when compared to oxidation of polymer alone).

With regard to claim 25, Thorp teaches an embodiment of claim 1, wherein the third primer (P3) and/or the fourth primer (P4) exhibits a label which can be detected, in particular, fluorescence-optically or electrically or electrochemically by means of the electrode (E) and which is preferably redox-active (Example 6 and 8, where guanine sequences were detected on the electrode and in the presence of guanine a change in conductivity is observed, see Abstract and p. 22-23, where the catalytic enhancement of oxidation current in the presence of a 20-mer G probe indicate that approximate 10 uC more charge or  $10^{-10}$  more moles of electrons are transferred when compared to oxidation of polymer alone).

It would have been *prima facie* obvious to one of ordinary skill in the art at the time the invention was made to have applied the thin film electrode teachings of Thorp to the method of sequence analysis taught by Heath and Wong to arrive at the claimed invention with a reasonable expectation for success. As taught by Thorp, "the electrode of the invention is useful for the electrochemical detection of aqueous GMP, poly G and surface immobilized nucleic acids containing a preselected base" (p. 7-8). Therefore, it would have been obvious to one of

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ordinary skill in the art at the time the invention was made to have applied the thin film electrode teachings of Thorp to the method of sequence analysis taught by Heath and Wong to arrive at the claimed invention with a reasonable expectation for success.

13. Claims 26-27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wong et al. (US Patent 5,935,793; August 1999) in view of Heath et al. (Journal of Medical Genetics, 2000, 37: 272-280) and Thorp et al. (WO 00/55366; September 2000) as applied to claims 22-26, 28 and 29 above, and further in view of Jenison et al. (Biosensors and Bioelectronics 2001, vol. 16, p. 757-763). Wong teaches a method that comprises amplification using tagged primers and hybridization of the amplification products to an identifying tag specific array (Abstract). Wong in view of Heath and Thorp teach all of the limitation of claims 22-26, 28 and 29 as recited above. However, none of these references teach that the label comprises an affinity molecule and that it is detected using a counter molecule. Jenison teaches a thin film biosensor wherein the sample is labeled with biotin and detected using a change in color through horseradish peroxidase (Abstract).

With regard to claim 26, Jenison teaches an embodiment of claim 25, wherein the label exhibits a specific affinity molecule, an osmium complex, a nanogold particle, a cysteine, ferrocenyl, daunomycin, benzoquinone, naphthoquinone, anthraquinone or p aminophenol group, a dye, in particular indophenol, thiazine or phenazine, or a fluorescent dye, in particular 6-FAM, HEX, TET, Cy3, Cy5, IILDye™700, IRDye™800, Biodipy, fluorescein, Joe, Rox, TAIVIRA or Texas Red (Figure 1, where the detector sequence is labeled with biotin).

With regard to claim 27, Jenison teaches an embodiment of claim 25, wherein the label is an affinity molecule and it is detected using a counter molecule which specifically binds the affinity molecule, with the counter molecule being conjugated with an enzyme which can convert a substrate such that the reaction product can be specifically detected electrochemically or optically (Figure 1, where the detector sequence is labeled with biotin and detected using an anti-biotin antibody labeled with horseradish peroxidase).

It would have been *prima facie* obvious to one of ordinary skill in the art at the time the invention was made to have adjusted the teachings of Heath, Wong and Thorp to include the means of detection taught by Jenison to arrive at the claimed invention with a reasonable expectation for success. As taught by Jenison, “rapid, sensitive assays for nucleic acid amplification products have utility for the identification of bacterial or viral infections. We have developed a nucleic acid hybridization assay utilizing thin film technology that permits visual detection of hybrids. The silicon-based biosensor detects the presence of target sequences by enzymatically transducing the formation of nucleic acid hybrids into molecular thin films. These films alter the interference pattern of light on the biosensor surface” (Abstract). Therefore, one of ordinary skill in the art at the time the invention was made would have been motivated to have adjusted the teachings of Heath, Wong and Thorp to include the means of detection taught by Jenison to arrive at the claimed invention with a reasonable expectation for success.

14. Claim 30 is rejected under 35 U.S.C. 103(a) as being unpatentable over Wong et al. (US Patent 5,935,793; August 1999) in view of Heath et al. (Journal of Medical Genetics, 2000, 37: 272-280) as applied to claims 1-2, 4-9, 12-19 and 21 above, and further in view of Eberwine et

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al. (PNAS, 1992, vol. 89, p. 3010-3014). Wong teaches a method of sequencing using tagged primers that are hybridized to an array to identify the sequence (Abstract).

Wong in view of Heath teach the limitations of claims 1-2, 4-9, 12-19 and 21. However, neither teach detection of RNA using transcription into DNA. Eberwine teaches the detection of RNA samples through transcription of the RNA into DNA (Abstract).

With regard to claim 30, Eberwine teaches an embodiment of claim 1, wherein an RNA is detected indirectly by transcribing it into a DNA and then detecting the DNA as nucleic acid A (Figure 2, where RNA is transcribed into DNA and see p. 3011, 'materials and methods' heading).

It would have been *prima facie* obvious to one of ordinary skill in the art at the time the invention was made to have modified the teachings of Heath and Wong to include the ability to detect RNA samples using a DNA platform following transcription of the RNA into DNA as taught by Eberwine to arrive at the claimed invention with a reasonable expectation for success. As taught by Eberwine, "the first step is the synthesis of an oligo(dT) primer that is extended at the 5' end with a T7 RNA polymerase promoter. This oligonucleotide can be used to prime the poly(A)+ mRNA population for cDNA synthesis" (p. 3010, col. 1). The ability to detect not only DNA sequences but also to detect RNA sequences as taught by Eberwine provides flexibility to the method taught by Heath and Wong. Therefore, one of ordinary skill in the art at the time the invention was made would have been motivated to have modified the teachings of Heath and Wong to include the ability to detect RNA samples using a DNA platform following transcription of the RNA into DNA as taught by Eberwine to arrive at the claimed invention with a reasonable expectation for success.

### ***Response to Arguments***

Applicant's arguments filed February 17, 2009 have been fully considered but they are not persuasive. However, a portion of the response, directed to the P3/P4 primers (see p. 18-19) was persuasive. Therefore, the rejection was reworded to reject that aspect of claim 1 under Heath instead of Wong.

Applicant traverses the rejection of claims as obvious over Wong in view of Heath. While Applicant's arguments have been carefully considered, they are not persuasive. Applicant argues that "the method taught by Wong is not at all similar to the method of Heath". Applicant argues that "universal primer sequences and tag sequences as such are used in numerous DNA-based methods".. "because these features do not necessarily serve the same purpose in different methods". Applicant asserts "Wong and Heath make use of a universal primer sequence for completely different reasons" (p. 15 of remarks). Applicant describe the uses of the universal primer sequence in Wong and Heath. However, this argument is not perusasive because ultimately, Wong and Heath both use the universal primer sequence for the same reason - as a binding site for primer extension. Divergence in the two methods regarding the use(s) of the products of the primer extension does not teach away from the fact that the two methods share a universal primer site as part of a tag sequence. Therefore, this first aspect of Applicant's argument is not persuasive.

Next, Applicant asserts "even if the hypothetical person of ordinary skill would consider combining the teachings of Wong and Heath, suich a combination would not lead a person to the



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claimed invention". Applicant again asserts "it remains completely unclear how one could use the teachings of Heath with the sequencing method of Wong". As noted in the prior final office action, the rejection clearly states how the two methods share multiple similarities and it would have been obvious to incorporate a second primer (as taught by Heath) into the method taught by Wong. To state it more explicitly, as noted in the prior reaction, it would have been prima facie obvious to incorporate the primer format taught by Wong in PCR amplification, as taught by Heath. Therefore, while applicant disagrees with the combination, Applicant's arguments are not persuasive and the rejection has been maintained.

### ***Conclusion***

No claims are allowed. All claims stand rejected.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to STEPHANIE K. MUMMERT whose telephone number is (571)272-8503. The examiner can normally be reached on M-F, 9:00-5:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Gary Benzion can be reached on 571-272-0782. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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